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Author(s): Julie Cruikshank

Source: *Arctic*, Dec., 2001, Vol. 54, No. 4 (Dec., 2001), pp. 377-393

Published by: Arctic Institute of North America

Stable URL: <https://www.jstor.org/stable/40512394>

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# Glaciers and Climate Change: Perspectives from Oral Tradition

JULIE CRUIKSHANK<sup>1</sup>

(Received 18 September 2000; accepted in revised form 15 January 2001)

**ABSTRACT.** In northwestern North America, glaciers figure prominently in both indigenous oral traditions and narratives of geophysical sciences. These perspectives intersect in discussions about global warming, predicted to be extreme at Arctic and Subarctic latitudes and an area of concern for both local people and scientists. Indigenous people in northwestern North America have experienced climate variability associated with the latter phases of the Little Ice Age (approximately 1550–1850). This paper draws on oral traditions passed down from that period, some recorded between 1900 and the early 1950s in coastal Alaska Tlingit communities and others recorded more recently with elders from Yukon First Nations. The narratives concern human travel to the Gulf of Alaska foreshore at the end of the Little Ice Age from the Copper River, from the Alaska panhandle, and from the upper Alsek-Tatshenshini drainage, as well as observations about glacier advances, retreats, and surges. The paper addresses two large policy debates. One concerns the incorporation of local knowledge into scientific research. The second addresses the way in which oral tradition contributes another variety of historical understanding in areas of the world where written documents are relatively recent. Academic debates, whether in science or in history, too often evaluate local expertise as data or evidence, rather than as knowledge or theory that might contribute different perspectives to academic questions.

**Key words:** environmental change, exploration narratives, Gulf of Alaska, Little Ice Age, oral tradition, science studies, traditional knowledge, Yukon

**RÉSUMÉ.** Dans le nord-ouest de l'Amérique du Nord, les glaciers occupent une place prépondérante aussi bien dans les traditions orales autochtones que dans les comptes-rendus des sciences géophysiques. Ces perspectives se recoupent dans les discussions concernant le réchauffement de la planète, que l'on prévoit extrême aux latitudes arctiques et subarctiques et qui préoccupe à la fois les habitants de la région et les scientifiques. Les peuples autochtones du nord-ouest de l'Amérique du Nord ont connu la variabilité du climat associée aux dernières phases du petit âge glaciaire (de 1550 à 1850 environ). Cet article fait appel aux traditions orales transmises depuis cette période, certaines consignées entre 1900 et le début des années 50 dans les communautés tlingit de la région côtière de l'Alaska, et d'autres consignées plus récemment auprès d'ânés des Premières nations du Yukon. Les récits parlent d'hommes qui, à la fin du petit âge glaciaire, se rendaient jusqu'à l'estran du golfe d'Alaska depuis la rivière Copper, l'Enclave de l'Alaska et le bassin supérieur Tatshenshini-Alsek, ainsi que d'observations d'avancées et de retraits des glaciers et de crues glaciaires. L'article se penche sur deux grands débats d'orientation. L'un concerne l'intégration du savoir local dans la recherche scientifique. L'autre traite de la façon dont la tradition orale apporte une autre sorte de compréhension historique dans des régions du monde où les documents écrits sont relativement récents. Les débats académiques, qu'ils relèvent du domaine de la science ou de l'histoire, évaluent trop souvent l'expertise locale comme une donnée ou une preuve, plutôt que comme un savoir ou une théorie capable d'apporter des perspectives différentes aux questions académiques.

**Mots clés:** changement environnemental, comptes-rendus d'exploration, golfe d'Alaska, petit âge glaciaire, tradition orale, études des sciences, savoir traditionnel, Yukon

Traduit pour la revue *Arctic* par Nésida Loyer.

The glaciers creep  
Like snakes that watch their prey, from their far fountains,  
Slow rolling on.... Percy Bysshe Shelley, "Mont Blanc"  
(1816)

In one place Alsek River runs under a glacier. People can pass beneath in their canoes, but, if anyone speaks while they are under it, the glacier comes down on them. They say that in those times this glacier was like an animal, and could hear what was said to it... Deikinaak'w, speaking at Sitka in 1904 (cited in Swanton, 1909:67)

The climate system is an angry beast and we are poking at it with sticks! Wallace S. Broecker (cited in Stevens, 1998:F1, F6)

Evidence that global climate change will be amplified at Arctic and Subarctic latitudes seems overwhelming. Scientists may disagree about the magnitude of globally averaged temperature changes, the rates at which change may occur, or the role of humans in the process. But they do agree that globally averaged winter temperatures are likely to increase by 4–8°C in circumpolar regions during

<sup>1</sup> Department of Anthropology and Sociology, 6303 Northwest Marine Drive, Vancouver, British Columbia V6T 1Z1, Canada; crui@interchange.ubc.ca

the 21st century (Peterson and Johnson, 1995; IPCC, 1996). Parts of northern Canada experienced a 1.5°C increase during the 20th century (Cohen, 1997), and maps of global warming show Siberia as a “hot-spot” that could contribute to further warming as permafrost melts, eventually releasing methane into the atmosphere.

Scientists can monitor these developments, but this is not a problem that science can fix. Increasingly, transdisciplinary initiatives addressing human dimensions of climate change bridge the physical and social sciences and extend beyond the academy to localist perspectives on the making, meaning, and evaluation of scientific knowledge (Fairhead and Leach, 1996; Wynne, 1996; Shapin, 1998). One emerging conjunction of cultural anthropology, environmental earth sciences, and Athapaskan and Tlingit oral traditions especially interests me because of conversations I have had with elders from the Yukon and Alaska whose immediate ancestors had direct experience with climate variability. The Little Ice Age, spanning roughly 1550–1850, was characterized by lower temperatures over much of the globe, with significant consequences for climate at high latitudes (Grove, 1988). Memories of 18th century clan migrations involving glacier travel remain vivid in indigenous oral traditions from this region, as do accounts from the 19th century about extremely cold summers and catastrophic consequences of surging glaciers, and 20th century observations about changes in flora and fauna.

Romantic poets, Tlingit elders, and prestigious geophysicists (such as the three quoted above) bring different approaches to understanding climate change, but they no longer sound as incompatible as they once did. Shelley wrote his poem “Mont Blanc” while visiting the Alps in 1816, the reputed “year without a summer” (Harington, 1992) in which Mary Shelley also wrote *Frankenstein*, sending her protagonist deep into alpine glaciers during his tormented struggle to become human. Deikinaak’w, a senior Tlingit man who spoke at length with John Swanton at Sitka in 1904, was reflecting on accounts he had heard about glacier surges on the Alsek River during the previous century. And Wallace Broecker, a leading geophysicist from Columbia University’s Lamont-Doherty Earth Observatory, wrote at the end of the millennium, addressing a *New York Times* readership concerned about climate change.

The potential for scientific modeling of past climates has increased enormously during the last decade, but so has our knowledge of the richness of oral tradition from the circumpolar North, raising questions about possible contributions of local, indigenous expertise to larger public and scientific debates about global climate change. This paper discusses potential contributions of oral tradition to two broader academic and policy debates. One concerns incorporation of indigenous knowledge or traditional ecological knowledge (often framed merely by acronyms IK or TEK) into scientific research. The other addresses contributions of oral tradition to another variety of histori-

cal understanding in areas of the world where written documentation is relatively recent, partial, or absent. My questions center on how knowledge gets authorized in different contexts, who gets to control it, and how it changes over time. What do indigenous residents living near the highest mountains in North America have to say about long-term and recent human ecology in this region, and how do their concerns overlap with or differ from those of scientists? How do regional political and economic practices involved in setting aside protected areas (such as parks) intersect with global practices (such as scientific research) that make claims on these sites? Can local perspectives contribute to the global strategies needed to address environmental problems such as climate change?

I am especially interested in intersecting narratives, some conventionally labeled “myth” and others framed as science, about glaciers that flow from the Icefield Ranges, linking the Gulf of Alaska and the inland Yukon Plateau. Intensive international scientific research began in the area in the 1960s (Bushnell and Ragle, 1969, 1970, 1972; Bushnell and Marcus, 1974; Holdsworth, 1999). These glaciers have been in the same place for thousands of years and have survived successive ice ages. The ice is continuously replaced by precipitation. Glaciologists now believe that at very high altitudes, where moisture and flow are minimal, ice cores will provide a record from which thousands of years of climate history may be “read”—a metaphor harkening back to Plato’s concept and St. Augustine’s elaboration of the “Book of Nature” (Shapin, 1996:58, 78). Mount Logan (5959 m), the second-highest mountain in North America, is one such place.

Athapaskan and Tlingit oral traditions attribute to glaciers characteristics rather different from those discovered through science. Glaciers have long provided travel routes that enabled human connections between coast and interior, and they are characterized by sentience: they listen, pay attention, and respond to human behavior—especially to indiscretion. One serious prohibition in the Yukon, for example, concerns “cooking with grease” (Smith in Cruikshank et al., 1990:209), and elders have frequently expressed dismay at the idea of overnight campers and hikers’ frying bacon near glaciers in the national parks now inscribed on this region. The historical and cultural crevasses separating these narratives seem so deep that they rarely intersect. Yet, glaciers figure prominently in both indigenous oral traditions and the narratives of geophysical science and the two different approaches collide in unexpected ways in contemporary discussions about climate change.

Scientists conceptualize climate change as a global process, detached from specific field sites where they do their research. They are particularly interested in mountainous Subarctic regions where combinations of low sun angle, strong seasonal differences in radiation, rugged topography, extreme ecological changes with altitude, and extensive snow and ice cover focus and exaggerate climate impacts (Roots, 1993). They recognize that social and

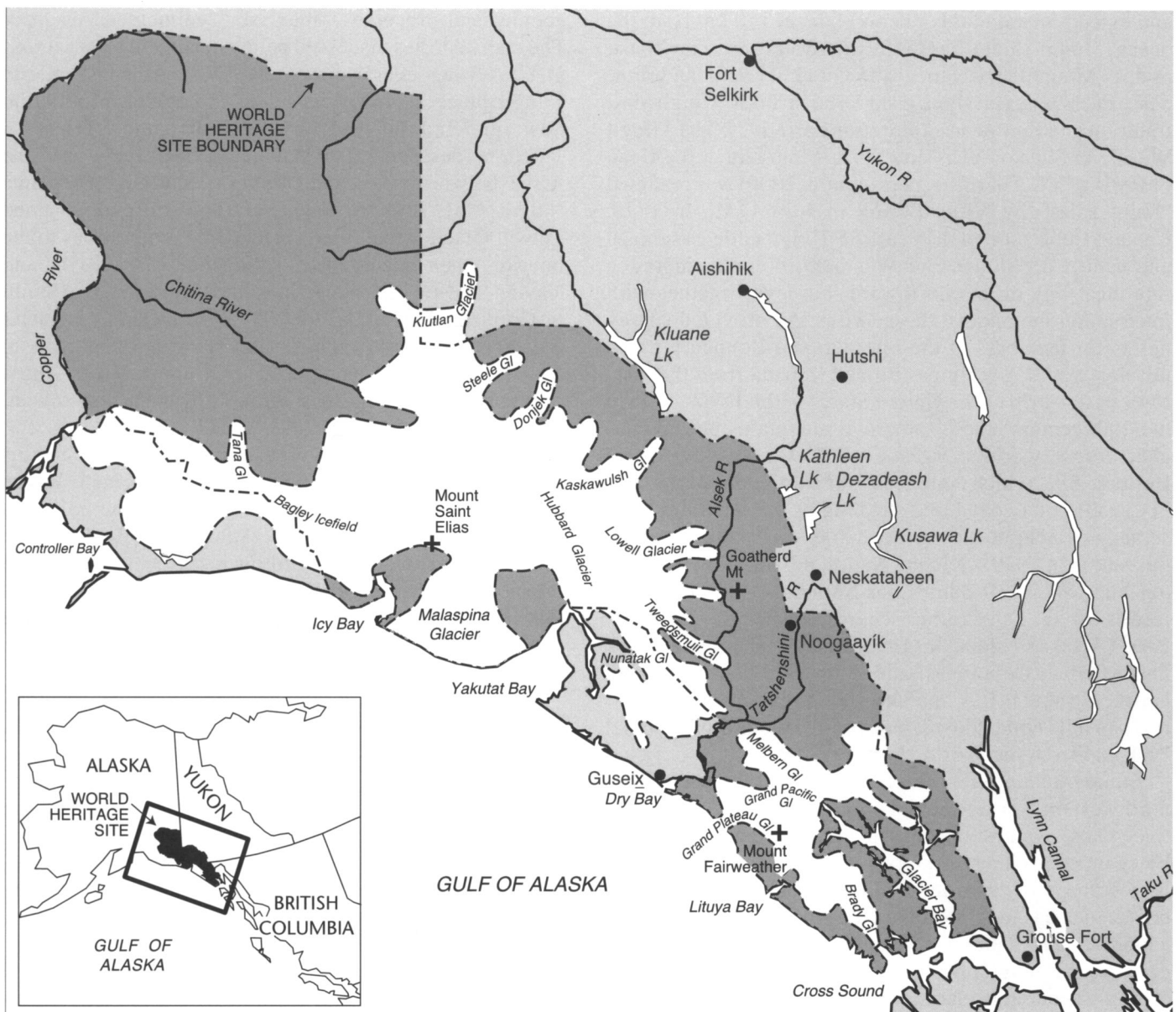


FIG. 1. Map of the Gulf of Alaska and southwest Yukon, indicating the approximate extent of present glaciers and the World Heritage Site boundary. Prepared by Eric Leinberger.

natural factors are profoundly linked, but define their own role as disentangling what they call “natural forcing mechanisms” from anthropogenic factors driving climate change (Overpeck et al., 1997:1252).

If climate change is a global process, it has profoundly local consequences. Projections about global warming raise critical concerns for residents of northern indigenous communities that are currently completing land-claim negotiations and implementing economic and political planning processes mandated by self-governance agreements. In debates about climate, the universalizing discourse of science plays a significant role. But resident peoples are aware that science is invoked both to attack and to defend local participation in management, and that local knowledge is both advocated and opposed as a basis for making decisions (Scott, 1996; Nadasdy, 1999).

Reflections by indigenous Northerners on the nature of science and scientists are recurring issues in the circumpolar North (Cruikshank, 1998; Fienup-Riordan, 1999).

The paper focuses on oral narratives told about glacier travel in a specific region during and following the Little Ice Age. Figure 1 represents the study area: the Gulf of Alaska coast between the Copper River and Cross Sound and the Aisek-Tatshenshini river drainage flowing to this coast from the Yukon interior.

#### GULF OF ALASKA: LAYERED PERSPECTIVES

Some of the highest mountains in North America, undergirding the Northern Hemisphere’s most extensive glaciation outside Greenland, overlook the Gulf of Alaska

and extend inland to the Yukon Plateau, 150 km from the ocean. Mount Saint Elias (5489 m) towers above the coast, as does Mount Fairweather (4663 m) 250 km to the south-east. Each plays a significant role in both Tlingit oral tradition and European exploration narratives. The Tlingit *Waas'eita Shaa* or *Yaas'eita Shaa* 'Mountain at the Head of Icy Bay' (T. Thornton, pers. comm. 2000) was renamed "Saint Elias" by Vitus Bering in July 1741. In 1778, Captain Cook spotted the peak the Tlingit called *Tsalxaan* and named it "Mount Fair Weather" to commemorate a rare clear day on his northward journey. Together with intervening mountains, these two peaks provided survey points for members of the International Boundary Commission who doggedly partitioned Canada from this narrow coastal strip of the United States in the 1890s. Late in the 20th century, these same two mountains became anchors for the world's largest UNESCO-designated World Heritage Site, which embraces four contiguous parks: two in Canada and two in the United States. Mount Saint Elias serves as linchpin for the two parks originally accorded this status in 1979—Kluane National Park (Yukon Territory) and Wrangell-Saint Elias National Park (Alaska)—just as Mount Fairweather secures Glacier Bay National Park (Alaska), added in 1992, and Tatshenshini-Alsek Park (British Columbia), added in 1993. The foreshore between Yakutat Bay and Dry Bay, the focus of much of this paper, is notably exempted from Glacier Bay National Park and from the World Heritage Site.

Ethnographic, scientific, and historical literature from northwestern North America provides an intriguing narrative of how exploration and science went hand in hand and how canonical historical and scientific knowledge emerged here during two centuries. A dominant narrative of northern science has long portrayed the Arctic and Subarctic as a kind of super-laboratory, but environmental sciences—geophysics, geography, geology, biology, and botany—are more accurately characterized as field sciences than as closed, controlled laboratory sciences. Like the idea of the laboratory, the notion of the field, inhabited by articulate, politically situated resident peoples, has always been complicated (Kuklick and Kohler, 1996).

Both geophysical scientists and indigenous residents speak figuratively of memory and sedimentation, but they express these concepts differently. Scientists suggest that ice cores from near the summit of Mount Logan reveal the shadow of the Industrial Revolution and retain a memory of climate that may soon allow them to interpret Holocene history. They anticipate that, in combination with tree ring records (dendrochronology) and the sedimentary record in lakes and glacial deposits, ice cores will tell a detailed story about the early-Holocene cooling event some 8200 years ago and the environmental catastrophes that followed the two White River volcanic eruptions (ca. 100 A.D. and 800 A.D.). Ice cores should also yield information about melting, trace metals, and biological organisms.

Memories of the Little Ice Age also play a significant role in indigenous oral traditions, and—like stories of

geophysical processes—they are "sedimented" on land. The clan histories discussed below document travel across glaciers from several directions. Eyak, Athapaskan, and Tlingit place names encapsulate ecological information now rendered invisible by English names. Southern Tutchone descendants of Athapaskans actively used the Alsek between coast and interior. They gave the name *Nàlùdi* 'fish stop' to a glacier (now officially named Lowell Glacier) that interrupted salmon migrations to the interior when it surged, blocking the Alsek River and leaving land-locked salmon in inland Kathleen Lake (Smith in Cruikshank et al., 1990:205–208). Details of glacier travel are recorded in songs, such as the walking, resting, and dancing songs composed by Copper River Ahna during their 18th century migration over glaciers toward the coast (de Laguna, 1972:232, 237, 239, 1226–1227). Raven, the trickster and world-maker, left evidence of his travels in geographical features he transformed. Raven once strategically disappeared down the blow-hole of a whale and spent the winter feasting comfortably on the finest blubber, eventually piloting his dying host ashore to the mouth of the Alsek River, where it remains an island that resembles a beached whale. At Mount Fairweather (*Tsalxaan*), Raven slashed one side of that mountain where Echo had offended him (de Laguna, 1972:84, 93).

Both oral accounts and scientific research suggest that, as land and ice stabilized following glacial recessions, salmon began moving inland up the Alsek-Tatshenshini River system, while glacial barriers, forming and breaking on the Alsek, prevented animals from moving downriver to the coast until much later (de Laguna, 1972:35–55). Humans began moving in both directions, as did their stories. The Icefield Ranges undoubtedly posed serious barriers to human and animal movements, but glaciers flowing from them seem also to have connected people by providing efficient travel routes. The earliest visiting geologists referred to these glaciers as "ice flooded valleys" (Russell, 1892:46) and coined the term "through glaciers," referring to glacial plateaus leading inland (Tarr and Butler 1909:36). Anthropologist Frederica de Laguna (1972:85, 86, 91) described the Alsek River as a "highway" to the interior, accessible from Yakutat Bay via the Nunatak and Hidden Glaciers, from Glacier Bay via Melbern and Grand Pacific Glaciers, and from Lituya Bay by a route across the Grand Plateau Glacier. Nunataks (knobs of bedrock poking through the icefields) reportedly provided navigational guides, as we hear below. Well before the European fur trade was established, there was brisk trade between coast and interior in marine products varying from fish oil to seaweed, which were exchanged for native copper and tanned hides (de Laguna, 1972:16, 348; McClellan, 1981).

Subsequent international boundaries imbricated by parks, preserves, sanctuaries, and national forests have proven more divisive to travel, sociality, and exchange than mountains and glaciers ever were (de Laguna, 1990). Tlingit people living on the Gulf foreshore and interior

Southern Tutchone Athapaskans are now divided by federal, state, territorial, and provincial bureaucracies charged with administering lands that straddle four jurisdictions. Speaking to Walter Goldschmidt in 1946, a Yakutat Tlingit man from the coast commented on the Alsek, "Nobody goes up it. There are good hunting grounds but [they are] on the Canadian side of the line" (Goldschmidt and Haas, 1998:51). Inland, Southern Tutchone were unable to maintain their everyday connections with coastal territories after they were prohibited from hunting in the newly designated Kluane Game Sanctuary in 1942 (Cruikshank, 1985).

#### LITTLE ICE AGE HABITAT IN THE GULF OF ALASKA

Glacial activity has severely eroded the archaeological record in the Gulf of Alaska. Human habitation was possible by 9000 B.P. (Davis, 1900; Ames, 1994; Matson and Coupland, 1995), but any record of human history was erased 3000–5000 years ago by readvancing glaciers. A subsequent recession 2000 years ago (de Laguna et al., 1964:84–87) was reversed within a millennium: an enlarged and combined Malaspina and Hubbard Glacier, joined by lesser glaciers, descended slowly and continuously from Mount Saint Elias, filling Icy Bay and Yakutat Bay a thousand years ago. Swelling into tidewater beyond the present-day mouths of these two bays, these glaciers created a continuous wall of ice some 1000 m thick extending northwest of Yakutat Bay for at least 120 km. Another recession 600 years ago caused ice to waste behind present-day limits. Carbon-dated wood shards from moraines indicate that tenacious forests had already matured on these newly emerging lands when they were crushed and encased in gravel during the Little Ice Age advance in the 16th century (de Laguna et al., 1964; de Laguna, 1972). South of Dry Bay, similar patterns occurred beneath Mount Fairweather: ice stood at the mouth of Lituya Bay a thousand years ago, when the Grand Plateau glacier spilled into the Pacific (Miller, 1960).

During the Little Ice Age, the ice-free foreshore between Yakutat Bay and Dry Bay was surrounded on three sides by glaciers, much as it is now encased by national parks and a World Heritage Site. The Malaspina Glacier at the north end and the combined Grand Pacific and Grand Plateau glaciers farther south must have sat like giant bookends enclosing this slim, 60 km beach backed by the Hubbard, Tweedsmuir, and Melbern glaciers. But these "bookends" were far from stable during the 17th and 18th centuries, and they posed alarming risks for human immigrants. Both local oral traditions and observations by European visitors convey some of the uncertainty that must have accompanied daily life in the area during that period. Archibald Menzies, ship's surgeon and naturalist with George Vancouver's expedition from 1791 until 1795, recorded his observations about Icy Bay in 1794: it was "choaked [sic] with massy ice and frozen snow"

(Olson, 1993:145). But the Malaspina seems to have advanced further by the time Belcher arrived in 1837; he encountered a 30-foot ice cliff and found no evidence of the trees that Vancouver had observed (Belcher, 1843:70–81). When British alpinist Harold Topham visited Icy Bay in 1888, he learned from local Natives that an ice dam had formerly blocked the Yahtse River. When it broke, massive chunks of ice carried downriver had destroyed a village formerly at the bay's mouth (Topham, 1889:432–433). Geologists Tarr and Martin later estimated that this flood must have occurred during the mid-19th century and certainly before 1886, when Seton-Karr, Libbey, and Schwatka encountered a glacier 25 miles wide filling the bay (Tarr and Martin, 1914:46–47). Much later, de Laguna (1972:97, 286) heard an account of this event from people at Yakutat. They attributed the outburst flood to flamboyant behavior by some young Tlingit men who had taunted the glacier, inciting it to surge. She also heard that the glacier began to recede rapidly in 1904, and that the sudden melting was attributed to evisceration of a Tsimshian sea otter hunter, whose entrails were left in a crevasse just northwest of Icy Bay so that his preserved body could later be returned home. Icy Bay was six miles deep and five miles wide by the 1940s and is still considered a fine sealing camp by Yakutat hunters (Goldschmidt and Haas, 1998:46; T. Thornton, pers. comm. 2000).

At the other end of this "bookended" beach, Lituya Bay was fully open when the French navigator La Pérouse visited and mapped it in 1786. Initially hopeful that he had discovered a northwest passage to Hudson Bay, La Pérouse revised his expectations when he encountered the glaciers sliding down from Mount Fairweather to the head of Lituya Bay. He returned to camp, "having finished our voyage to the interior of America in a few hours" (Milet-Mureau, 1799:373–374). When Otto Klotz visited the same glaciers with the Boundary Commission in 1894, they had again advanced, altering the bay's contours from those La Pérouse described. Klotz (1899:526, 528) also noted that a "deserted Indian village" near [Brady] glacier, identified by Vancouver in 1794, was under 1000 feet of ice by 1894. In 1904, ethnographer John Swanton (1909:337–338) recorded an account, discussed below, that probably described this same destructive event.

During the global warming that accompanied late stages of the Little Ice Age in the 18th century, wasting glaciers deposited debris that extended the ice-free foreshore between Yakutat Bay and Dry Bay, providing an especially attractive habitat for new populations. Geologist Israel Russell, who visited Icy Bay in 1893, described the emerging land as "a natural garden" and "one great strawberry meadow" (de Laguna, 1972:98). In 1905, Ralph Tarr marveled at the process by which land was actually growing seaward: offshore bars developed, creating lagoons behind them that subsequently filled. The coast, Tarr wrote enthusiastically, "is characterized by features of youth," and "the coastline is rapidly growing outward, not as a fan does, by steady growth, but by successive steps or

leaps, as offshore bars develop” (Tarr and Butler, 1909:144).

The Eyak, never a large nation, were the earliest known inhabitants at Yakutat Bay. Subsequent arrivals adopted the place name “Yakutat” from the Eyak word *Ya.gada.at* (Krauss, 1982:56) meaning ‘a lagoon is forming,’ and referring to open water that appeared as the glacier melted (de Laguna, 1972:59). The Eyak came originally from the interior, where they once shared a language with ancestors of Athapaskans, but the prehistory of the Eyak and their long linguistic isolation, possibly for thousands of years, remain a mystery. One hypothesis is that they may have been separated from Athapaskan speakers by glaciers during earlier advances (Krauss, 1982:11–13). Sometime during the 18th century, the Eyak were joined by newcomers: Athapaskans from Dry Bay and from the Copper River, Tlingit clans moving north from Prince of Wales Island (Swanton, 1909:352, 355–356, 358) and ultimately, in the 1780s and 1790s, British, French, Russians, and Spaniards.

On the alluvial fan of the Alsek River now known as Dry Bay, Athapaskans (Dän) from the interior were the earliest known residents, and their prior occupation is reflected in the Tlingit name for Dry Bay, *Gunanaxoo* ‘among the Athapaskans’ (Goldschmidt and Haas, 1998:51). By the mid-18th century, substantial Tlingit clans traveling north under pressure from expanding Haida were arriving by sea, while other clans were portaging up the Alsek and making return trips under ice bridges in dugouts (de Laguna et al., 1964:17–18).

In summary, then, in the late 18th century Gulf of Alaska, tentacles of European exploration were matched by a different kind of international expansion. Eyak, Tlingit, and Athapaskan nations converged on the narrow coastal lands that were becoming accessible as glaciers receded during late stages of the Little Ice Age. Scientific exploration began on the Alaskan coast a full century earlier than in the Yukon interior. But at the time of the earliest voyages by Cook (1778), La Pérouse (1786), and Vancouver (1794), Athapaskans were apparently crossing glaciers much larger than those we see today from the Copper and Alsek Rivers. Simultaneously, Tlingit were pressing north by sea from the Alaska archipelago. De Laguna (1972:17) has described this foreshore extending from Yakutat Bay to Dry Bay as the only area able to support more than a sparse population and as “with the possible exception of Greenland, the most beautiful country in the world.”

The remainder of this paper focuses on clan narratives that trace three broad travel corridors across glaciers: one from the Copper River, one from Cross Sound, and one along the Alsek River. These stories are “about” many things: historiography, experiential science, and complex verbal traditions. They are not specifically about glaciers. Yet glaciers figure significantly in these histories, which include close empirical observations about land and about humans inhabiting a rich but uncertain social and spiritual world that was changing dramatically in the late 18th century just before the arrival of Europeans.

I am interested here in what we can learn about the social histories of these stories. I draw on oral accounts recorded by John Swanton in Sitka and Wrangell in 1904 (Swanton, 1909), Walter Goldschmidt and Theodore Haas in Yakutat in 1946 (Goldschmidt and Haas, 1998), and Frederica de Laguna in Yakutat in 1949, 1952, and 1954 (de Laguna, 1972). Other sources are ongoing work by Nora and Richard Dauenhauer in southeastern Alaska (Dauenhauer and Dauenhauer, 1987) and Thomas Thornton’s ongoing work on the linguistics and social context of place naming (Thornton 1995, 1997). In the Yukon interior, Catharine McClellan’s work since the late 1940s is critical (McClellan, 1975). I rely on work that Kitty Smith, Annie Ned and Angela Sidney, and I did during the 1970s and 1980s (Cruikshank et al., 1990). I also draw on work by Gertie Tom with John Ritter at the Yukon Native Language Centre (Tom, 1987) and by Patrick Moore with the Kaska Tribal Council during the 1990s (Moore, 1999).

The significance of clans is crucial to the narratives discussed here. The Tlingit and their neighbors all claim membership in one of two matrilineal exogamous moieties (Raven and Eagle on the coast, and Crow and Wolf in the interior), with marriages between opposite-moiety clans regulating social behavior. On the coast, primary units of national history and property ownership were clans whose migration narratives were deeply embedded in kinship. Clans regulated access to resources as well as transmission of property, which included narratives of clan history and associated rights to tell them. Oral traditions from this region consistently demonstrate the social nature of all relations between humans and nonhumans, that is, animals and landscape features, including glaciers (Kan, 1999:14). Oral narratives have histories that capture some of the accumulating, vanishing, changing meanings associated with glaciers from the distant time of ice ages to the present era of parks, meanings that continue to be enmeshed in social worlds.

#### MOVING SOUTH: ARRIVAL BY LAND

In 1904 at Sitka, ethnographer John Swanton recorded an account of an 18th century migration to Yakutat made by the Kwáashk’i *Kwáan* clan, Ahtna-speaking Athapaskans from the Copper River region. The narrator, *K’áadasteen*, a clan member who grew up at Yakutat, dictated in Tlingit, while another Tlingit man, Don Cameron, assisted Swanton with translation (Swanton, 1909:347–368). Thirty-five years later, in 1939, John Harrington heard accounts from other clan members at Yakutat, and a decade later, in 1949 and again in 1952, Frederica de Laguna, working with his notes, recorded what women as well as men living in Yakutat could tell her about this migration. Narrators are in essential agreement about why clan members left their original inland home near the junction of the Chitina and Copper Rivers and the various routes by which they reached first Icy Bay, then

Yakutat Bay. They later intermarried with resident Eyak, took the Eyak name Kwáashk'i 'humpback salmon' as their clan name (de Laguna, 1972:222), and eventually adopted the Tlingit language and customs. Here, I am especially interested in how references to glacier travel enter their narratives.

K'áadasteen's story begins with the death of a Raven clan chief and internal dissent about disposition of his property, particularly a highly prized moosehorn dish. As conflict escalated, unsuccessful claimants, brothers with their clan sisters, chose to leave and headed eastward toward Mount Saint Elias. Pausing at the foot of the mountain to select a route, they clubbed some ground squirrels. As a direct consequence of this act, fog rolled in, and some of their members became separated from the main group. The remaining men and women were unable to delay because of the deteriorating weather and their own precarious situation, so they pressed on. They could see no easy route over the mountain, but they identified a glacier leading to the north side and followed it. Expecting to perish, they dressed in their finest marten and weasel skin clothes, so that they would be properly attired if they did not survive, and set out to make what may have been one of the earliest partial ascents of Mount Saint Elias. Gaining altitude, they were astounded to see an ocean for the first time, and held a quick caucus to discuss what this might mean. "The Athapascans did not know about the sea, and they called one another together," K'áadasteen explained. Descending to the glacier terminus, they crossed the Yahtse River boiling out from under the glacier and followed it to its mouth, now Icy Bay. Their first act was to claim Mount Saint Elias as their clan's crest because it had guided them across the ice from the Copper River, and they built a clan house to commemorate their successful arrival (de Laguna, 1972:349–350). Their route—from the Chitina River across the Tana Glacier and Bagley Icefield to the Gulf Coast—was a precontact Ahtna trade route (de Laguna and McClellan, 1981:651–652).

In 1949, de Laguna heard an account of this same journey from Harry Bremner (b. 1893), also a Kwáashk'i Kwáan clan member. Geologist Israel Russell (1892:171) once described this region as "a land of nunataks." Mr. Bremner described how his ancestors had navigated on Saint Elias mountain, using nunataks and mountain peaks for orientation and always watching for animals that might sustain them during this period when they were so near starvation: "Our people kept walking over the glacier. There was only ice, no bushes, nothing... They had nothing to eat. There was starvation out on the glacier. It was a long way for us to walk" (de Laguna, 1972:232). At one point, they thought they spotted a wolverine in the distance and walked toward it, then recognized that it was a nunatak, "a little island, a mountain with no trees on it, just a little hill." Desperately hungry, they made a small fire, and when a wolverine wandered into their camp, they fended off starvation by eating it. In the distance, they saw a rabbit and walked toward it for two days before they realized that it

was actually Mount Saint Elias: Yaas'eita Shaa. "It was a compass for the people so they wouldn't get lost... The mountain was so steep that they had to walk in zigzags up the snow... Then they finally found that Icy Bay, Yahtse. The glacier was all over the bay, way out... They built their camp on the west side at a place they named 'place of the yellow cedar bark'" (de Laguna, 1972:232).

Songs figure significantly in clan histories. K'áadasteen spoke to Swanton in 1909 about the five days the migrants had spent on the mountain, singing their Copper River songs and mourning their lost companions. De Laguna also heard these songs in 1949 from Sarah Williams, who contrasted them with those the people sang when they actually discovered Icy Bay: "They danced down from that mountain. They were happy when they were coming on this side. Lots of things happen[ed] there and there are songs [about these events]" (de Laguna, 1972:237; 1226–1227).

Another Kwáashk'i Kwáan clan member, Maggie Harry (b. 1892), told Harrington in 1939 and de Laguna in 1949 about an alternative sea route to Icy Bay. Her ancestor, one of the disinherited brothers, had traveled to the mouth of the Copper River with his family and approached the coast by sea. Just as overland migrants mistook Mount Saint Elias for a rabbit, the ocean travelers saw its snowy, white, triangular peak "looking like a seagull on the water" and used it to guide them to Yakutat. "Our tribe thought they saw a seagull far off when they first saw Mount Saint Elias. Every day it was getting higher" (de Laguna, 1972: 235, 236).

But Icy Bay was only a first step on their route southward. K'áadasteen explained that after settling into Icy Bay, one man began an experiment with his nephews, "living away from town in order to make the frame of a skin boat" (Swanton, 1909:350; de Laguna, 1972:241). "He told them to travel along the shore in the canoe he had made, to search for people," and indeed they found Yakutat Bay. Just as their predecessors had aroused bad weather by clubbing squirrels, these young men were the architects of their own difficulty. When they made the fatal mistake of laughing at the eulachon (*Thaleichthys pacificus*) they were cooking, they excited fierce south winds that drowned one and left the others stranded for 21 days (Swanton, 1909:351). From this trip, though, they learned that prior residents had already claimed Yakutat Bay: Athapaskan Kask'edi Raven clan members from Dry Bay had by then come from the Alsek River and intermarried with members of the Eyak Lux.edi Eagle clan (Swanton, 1909:352; de Laguna, 1972:242). Recognizing the attractions of Yakutat Bay, where glaciers were receding at the same time that the Malaspina was still advancing at Icy Bay, the uncle dispatched his nephews to their original homeland near the Copper/Chitina River to retrieve a valuable copper plate buried there. The nephews completed their return trip over the glaciers in half the time taken during their initial migration. Then the kinsmen gathered and, bearing the valuable copper (reportedly worth ten slaves), continued their overland trip, crossing the Malaspina Glacier that extended west from Icy Bay. Approaching Yakutat Bay,



the migrants emerged from behind the mountain onto a glacier that had gravel-covered steps leading down to the ocean. At each layer or platform, they stopped to compose a song and dance, until they finally reached the beach. At Yakutat, a lagoon had already formed behind melting ice, reportedly because someone had killed a dog and thrown it into a glacier crevasse. “And that’s why the glacier receded so far and left all the bay there. That’s why they call it ‘Yakutat’ ... That’s what it means—yakwdat means ‘lagoon’ in [Eyak] language up there....” Katy Dixon Isaac told de Laguna in 1952 (1972: 238.239). The immigrants used their copper to purchase Yakutat from the Kask’edi Raven clan, whom they then “sent away” (de Laguna, 1972:221, 227, 242, 251).

In K’áadasteen’s version of this Kwáashk’i Kwáan clan narrative, travel shifts back and forth from ocean to glacier, and clan members survive only because they have both sets of skills—those required for the sea and those needed to navigate glaciers. At Yakutat, one brother discovered a cottonwood tree at the head of a stream that reportedly provided useful weather predictions for glacier crossings. A prospective traveler could first listen carefully to the tree. A noise reverberating inside signaled a coming storm, making it unsafe to cross (Swanton, 1909:360). De Laguna (1972:242) says that although the glacier in this story had vanished by 1952, Yakutat residents still associated the tree with safe ice crossings. On another occasion, when the brothers were seal hunting in Yakutat Bay, their canoe was carried off by the swell raised by a calving glacier, and they had to fall back on mountain and glacier skills. It was winter; the wind was blowing and they ran out of food, but “when they became discouraged they made steps across the glacier. In one place was a precipice and they had a hard struggle” (Swanton, 1909:361). One brother was lost.

A single sentence near the end of this story foreshadows some of the global complexity reaching coastal shores by this time. “When they reached home” K’áadasteen reports, “there were other people in the town. These were the Teikweidí [clan] who had come up from Prince of Wales Island to the south” (Swanton, 1909:358). Elsewhere, de Laguna (1972:225–226) suggests that these Teikweidí clan members had been displaced from Prince of Wales Island by Haida about 1750. They pushed north, reached Yakutat very rapidly by sea, and were established as a powerful clan by the time Russians arrived in the late 1780s.

#### MOVING NORTH: ‘DISCOVERING’ THE ALSEK

Most 18th century migrants to the Gulf of Alaska were Tlingit, moving north under pressure from expanding Haida. Many of the 74 Tlingit clans enumerated by de Laguna (1990:227) no longer exist. Their loss reflects both normal processes in Tlingit social organization and catastrophic consequences of epidemics. Over time, there was inevitably strategic expansion of some clans at the expense

of others and fissioning of house groups to form new clans, and reversal of fortunes could accompany unexpected loss of membership. Trying to find chronology within oral tradition is probably fruitless, since that was seldom the teller’s purpose. With epidemics, however, chronology is inescapable, although cursory names and dates of diseases reveal little of their horror. Smallpox in 1775, 1836, and 1862; measles in 1800; and typhoid in 1819, 1848, and 1855 (de Laguna, 1972:277–278; Boyd, 1999:120–122, 213) all coincided with late stages of the Little Ice Age.

Oral histories suggest that Tlingit clans were arriving just as the Copper River Ahtna were asserting their claims from the opposite direction. Like the Ahtna, the Tlingit found this foreshore occupied. One version recalls earliest residents at Dry Bay as members of the interior Athapaskan Lukaax.ádi Raven clan. Swanton translated their name as “quick people” and described them as “very fast runners” because they moved swiftly “just like an arrow” and other people “could not catch up with them” (Swanton, 1908:400, 1909:356). In this version, they are described as “more of a river than a coastal people,” who relied largely on land animals rather than sea mammals and who made regular trips up the Alsek River to hunt, fish, gather berries, and trade with interior people (de Laguna, 1972:223–224). Coastal Lukaax.ádi now reject this interpretation of interior Athapaskan origins and name coastal villages farther south (including a place named Lukaax) as their original homeland (T. Thornton, pers. comm. 2000). It is possible that two clans with different origins combined at Dry Bay. Nevertheless, incoming Tlingit Eagle clans intermarried with Athapaskans, and together they founded the village of Guseix on the Akwe River near Dry Bay.

At Sitka in 1904, John Swanton met Deikinaak’w, the Tlingit man whose words open this paper. He describes him only briefly as “an old man of the Box House [Kaagwaantaan Eagle clan] people...also a church member but [whose] stories appear to be entirely after the ancient patterns” (Swanton, 1909:1). Swanton’s cursory introduction indicates that one-third of the narratives published in *Tlingit Myths and Texts* were actually told by Deikinaak’w. Of these, 28 were in English and nine, including the one summarized below, were recorded in Tlingit and translated by Don Cameron (Swanton, 1909:326–346). Swanton (1909:154–165) heard a second version of this narrative, in English, from Kaadashaan, a headman of the opposite-moiety Kaasx’gweidí Raven clan.

Each narrator tells how a Kaagwaantaan Tlingit ancestor named Kaakiex’wtí, living somewhere between Mount Fairweather and Cross Sound, traveled inland and met, then “organized” the Athapaskans living on the lower reaches of the Alsek River and ultimately incorporated them into trading relationships with Tlingit. Kaakiex’wtí’s journey was prompted by distressing events, including an epidemic, that led him to turn his back on the sea and head inland, fully prepared to die. He traversed a glacier that de Laguna suggests could refer to two probable routes. One originates at Icy Point, several miles north of the entrance

to Cross Sound, and leads across a glacier that has now receded, but on that route he would have required someone to ferry him across Lituya Bay to connect with beach access to Dry Bay. The other route begins at Glacier Bay on Cross Sound and would have involved a straightforward walk over the Melbern and Grand Pacific “through glaciers” to the Alsek River (de Laguna, 1972:90–91). *Kaakiex’wtí* headed northwest, using *Tsalxaan* (Mount Fairweather) as a compass, as well as a reliable guide to weather. He wore snowshoes with claws that allowed him to climb cliffs and cross glaciers (Swanton, 1909:329; see also Dauenhauer and Dauenhauer, 1987:153–165 and Thornton, 1997:298–300 for reconstructions of this journey).

Eventually, *Kaakiex’wtí* reached the Alsek River, where he encountered a party of Athapaskans. He studied them from a distance (just as they observed him), amazed to see that they had only the most rudimentary techniques for procuring food. Curiosity grew on both sides, and when they met, he taught them how to make fish traps for eulachon and salmon and deadfalls for groundhogs, how to preserve and store meat, roots, and berries, and how to use a pit oven. There is a hint of noblesse oblige in Tlingit versions: “The Athapaskans were very wild and did not seem to have any sense... [*Kaakiex’wtí*] was teaching the people there to live as do those down on the ocean” so that they could have “an easy time” (Swanton, 1909:158). These Athapaskans, in turn, arranged for him to marry “the daughter of a chief” (1909:332), and their wealth amazed *Kaakiex’wtí*: at his wedding, he received moose skins, marten skins, beaver skins, and two copper spears valued at two slaves. The relationship strengthened, and other glacier crossings are reported during *Kaakiex’wtí*’s residence on the Alsek, including the arrival of a slave from a Chilkat Tlingit community on the Lynn Canal via an interior route across a glacier to the Alsek (Swanton, 1909:162).

After two years, *Kaakiex’wtí* proposed that his Athapaskan in-laws accompany him back to his coastal home to initiate more systematic trade. They gathered “small coppers” and set off. At the first place he stopped, they had a rude shock. The Tlingit residents (members of the Chookaneidí clan) were so alarmed by the strangers that they insulted and dismissed them, forfeiting their opportunity to participate in what would become a flourishing trade (1909:160, 333). Persevering, the party crossed another glacier above Cross Sound and reached a Kaagwaantaan settlement on Cross Sound called “Sand Hill Town.” Thornton (1997:300) identifies this as *L’eiwshashakee Áan* ‘Town on the Glacial Sand Cut-backs,’ located at Bartlett Cove near the site of the present-day Glacier Bay National Park Visitor Centre. The Kaagwaantaan clan hosts were more welcoming and profited so much from their trade with the Athapaskans that they were able to build a large, eight-beamed Shadow House that took a year to complete. “The house was so big that a person who walked in front of it always appeared small, and when he entered, one had to speak loudly to be heard across” (Swanton, 1909:334–336).

Yet just a year later, *Deikinaak’w* continued, Shadow House was entirely crushed by an advancing glacier when a young, secluded menstruant angered it by speaking carelessly. “This girl said to the glacier, ‘Would that that glacier were my father’s,’ and during that night it began to grow out over their new house. It extended itself far out over the town, and the people fled from it...” (Swanton, 1909:337–338). The story also merges with one told more recently by two elders from the Chookaneidí clan, Susie James (in 1972) and Amy Marvin (in 1984), recorded in Tlingit and translated by Nora Dauenhauer (Dauenhauer and Dauenhauer, 1987:244–291; and Notes 407–431). Each insists, as part of her story, that the Kaagwaantaan clan was a mere house group within the Chookaneidí clan at this time and achieved independent clan status only after this glacial advance displaced them all. Geologist Ross Powell (1995) also points out that during the Little Ice Age, while glaciers in the rest of the world advanced only several hundred meters, those in the Glacier Bay Ice Field system experienced at least 80 km of terminus advance.

Narratives told by Susie James and Amy Marvin bring us closer to the heart of questions regarding the social consequences of climate change, because both take as their central theme issues of social responsibility. In each version, just as Swanton heard, a secluded young menstruant foolishly calls out to the glacier as though her words had no consequences, triggering the advance that destroys the village. The story’s impact lies in the choices people are forced to make instantaneously as the glacier advances with alarming speed. In one version, the girl’s grandmother insists that she will remain at the site so that her grandchild can go on to bear children, so crucial for the survival of the clan. In effect, she takes responsibility for the younger woman’s flippant words. In the other version, the young woman insists on remaining herself, accepting full responsibility for her actions and unwilling to face the shame of living with the consequences that her actions have unleashed on others. Whatever the outcome, the image of the “woman in the glacier” remains the embodiment of the Chookaneidí title to Glacier Bay, a claim clan members say is verified by the fact that they “paid for” this place with the blood of their ancestor, the woman in the glacier. Amy Martin concludes with the dispersal of house groups that were to become separate clans. “The Kaagwaantaan went to Ground Hog Bay. I guess it’s called Grouse Fort.... As for us [Chookaneidí], we continued away from them...” (Dauenhauer and Dauenhauer, 1987:289). Glaciation here has erased most remains of ancient settlements, and isostatic rebound and tectonic uplift make other sites hard to locate (Schroeder, 1995:279).

#### THE ALSEK AND TATSHENSHINI RIVERS

In August 1999, remains of a male hunter were discovered melting from a glacier near the Tatshenshini River. Remnants of clothing were preserved with him. While his



FIG. 2. “Costumes of the inhabitants of Port des Francais” (Lituya Bay), 1786, a drawing by Gaspard Duché de Vancy, artist with La Pérouse’s expedition. The man sitting second from left wears a tailored costume resembling Athapaskan clothing then being worn inland, near the Yukon River. Source: Dunmore and de Brossard, 1985: Plate 8, Vol. 1. Tous droits réservés.

identity is still unclear, he was probably traveling on one of the glacial routes between coast and interior. The Champagne-Aishihik First Nation in the southwest Yukon claims the territory where he was found, now within the Tatshenshini-Alsek Provincial Park, and has taken responsibility for working with government agencies and scientists involved in the analysis (Beattie et al., 2000). Early radiocarbon dates of 550 B.P. suggest that trade between coast and interior may have been underway by the 15th century. The hunter’s finely woven hat resembles those that Tlingit residents at Lituya Bay were wearing when La Pérouse visited in July 1786. “The head,” La Pérouse wrote, “they commonly cover with a little straw hat, curiously woven” (Milet-Mureau, 1799:401, 407), adding later that “hats and baskets of rushes are no where [sic] woven with more skill.”

When La Pérouse sailed into Lituya Bay, its first European visitor, he described it as a hub of human activity—a summer settlement occupied by experienced marine navigators who were probably using it as a base for northward expansion. “Every day we saw fresh canoes enter the bay; and every day whole villages departed, and gave place to others” (Milet-Mureau, 1799:390). At any

one time, he estimated, 300–400 people occupied the bay, and 700–800 more arrived during the month he spent there. The activities he described reflect a resolutely marine culture, and he found Tlingit men reluctant to guide him on land. Noting that despite their habit of traveling barefoot, they had no calluses, he concluded: “They travel only in canoes or with snowshoes” (Milet-Mureau, 1799:400).

La Pérouse’s descriptions of clothing suggest a flourishing trade with interior Athapaskans by that time. “The common dress of the grand chief was a short tanned [moose] skin bordered with a fringe of deer hoofs and beaks of birds, the jingling of which when he danced was not unlike sheep’s bells” (Milet-Mureau, 1799:401). Moose were unknown on the coast until the mid-20th century, when they began to move down the Alsek Valley (de Laguna, 1972:40, 367), so either hides or ready-made clothing preceded them. A drawing by the expedition’s artist, Gaspard Duché de Vancy, depicts a group of Tlingit residents at Lituya Bay in 1786 (Fig. 2). The man seated on the left is wearing an Athapaskan-style suit of tailored, tanned hide clothing, complete with footwear, that bears a striking resemblance to those in drawings made at Fort

Yukon six decades later in 1847–48 (Murray, 1910; see also description in McClellan, 1975:302–303).

By the mid 19th century, the Alsek River was an axis between coast and interior linked by different glaciers to Yakutat Bay, Glacier Bay, Lituya Bay, and the Lynn Canal. Upriver narratives about glacier travel share themes of sentience with those told on the coast, but a view from the interior centers on ambivalent relationships with coastal Tlingit and on the intentionality of glaciers that shared personhood with humans and animals. Inland narratives, like those told on the coast, are set in a dynamic landscape where named glaciers sometimes intruded unexpectedly on everyday life.

Inland, Yukon elders report intense periods of cold, privation, and loss of life during late stages of the Little Ice Age. In 1975, Rachel Dawson and Angela Sidney each told harrowing accounts of a “year there was no summer” during the 19th century, when even lakes failed to thaw and starvation took the lives of young and elderly (Cruikshank, 1979:164–167). Similar depictions are elaborated by Kaska living in southeastern Yukon (Moore, 1999:48–53, 246–267) and by Tutchone on the upper Yukon River and its tributaries (Tom, 1987:70–72; see also Harington, 1992). Closer to the coast, stories of extremely cold summers blend with accounts of glacier movements. The Icefield Ranges include surging glaciers that periodically begin to flow, sometimes for several kilometres and often quite rapidly. The Donjek, the Steele, the Lowell, the Fisher, the Tweedsmuir, and others have surged repeatedly in this century and may do so again. While there is no scientific correlation between surging glaciers and the Little Ice Age climate, elders often merge discussions about extreme cold with those about troublesome behavior of glaciers during the 19th century.

Clan narratives tell of river travel under ice bridges to the coast on every major river in this region. Deikinaak’w reported this for the Alsek (Swanton, 1909:67), and de Laguna also heard how Tlingit traders from Dry Bay traveled upriver over a portage on the west side of the Alsek and paddled downstream under glaciers (de Laguna et al., 1964:81). Stories are told along the Taku River (McClellan, 1975:447) and along the Stikine, the next major river 200 km to the south (McClellan, 1975:446; Sidney, in Cruikshank et al., 1990:39–40), about elderly men who made subglacial journeys, prepared to sacrifice their lives to benefit their descendants. Like the Copper River migrants who crossed glaciers on foot, the two men who navigated under the Taku glacier dressed in their finest clothing, painted their faces, and decorated their hair before undertaking the dangerous journey. Paddling toward the glacier, they composed songs for each stage of their journey. “This little child is going to take my place after I die,” one sang. Remarkably, they arrived at the other side of the glacier unscathed. Next, “two young fellows,” made the trip by boat, then ran back *over* the glacier to report the news. Then everyone walked across the glacier, collected fish, and returned on foot. The following year,

people say, the glacier dam broke and salmon returned upriver (McClellan, 1975:447–448). Tlingit elder Elizabeth Nyman explained the Taku glacier’s retreat as the result of blood on the glacier drained from a slave’s body, an explanation similar to those given for recessions at both Icy Bay and Yakutat Bay (Nyman and Leer, 1993:43).

A more common inland glacier story concerns travel to the coast by two trading partners, one Athapaskan and one Tlingit (Sidney, 1982:88–89; Smith, 1982:95–97; Ned, in Cruikshank et al., 1990:308–310). The Tlingit man slipped into a crevasse and his Athapaskan trading partner, terrified of being blamed, nevertheless traveled to the coast to report the tragedy. The grief-stricken relatives held a potlatch and then journeyed back to recover the body, but they discovered their kinsman alive, sustained both by the provisions he had carried and by food his relatives had offered to the fire at his potlatch. The story underscores the perils of glacier travel but also the responsibility of Athapaskan men to their Tlingit trading partners and the uncertain ethnic boundaries differentiating them.

Inland stories also concern glacial surges. The Lowell glacier, for instance, has crossed the Alsek River more than once. In the 1940s, anthropologists Catharine McClellan and Frederica de Laguna heard accounts of a lake that had built up behind its expanding flank sometime during the mid-19th century, then burst out—with catastrophic consequences. On the basis of oral and documentary accounts, de Laguna (1972:276) dates this event at roughly 1852. Geoscientists estimate that an ice dam 200 m high broke at about that time, discharging its water through the Alsek valley in an enormous flow that emptied that lake within one or two days (Clague, 1979). Mrs. Kitty Smith (b. approximately 1890), who spent her childhood near the area, says this glacier’s name (Nàlùdi ‘fish stop’) refers to the time when it first crossed the Alsek and built up against Goatherd Mountain, blocking the migration of salmon to the upper Alsek drainage. Her explanation of causes and consequences of the surge differs from one scientists would offer. A young Tlingit boy traveling with a party of coastal traders to the interior made fun of an Athapaskan shaman because of his balding head. “Ah, that old man,” he reportedly said, “the top of his head is just like the place where gophers play, a bare stump!” To punish this insolence, the shaman summoned the glacier across the river, creating a dam. The resulting outburst flood scoured the landscape and drowned Tlingit camping at the Alsek-Tatshenshini junction and at Dry Bay (Smith, in Cruikshank et al., 1990:205–208). Swanton (1909:65) also heard that two Athapaskan shamans predicted, then observed, a great flood that may relate to this event.

Nàlùdi has surged again, most recently in Mrs. Smith’s “Grandma’s time,” shortly after her own birth. That year, Nàlùdi blocked the river, flooding the valley basin in just a few days and killing hundreds of ground squirrels before the lake drained (Smith, in Cruikshank et al., 1990:205–208; McClellan, 1975:71–72). Again, de Laguna (1972:89) noted the catastrophic downstream effects of this 1890

flood. Other narratives attribute surges to glaciers that are dens for giant animals—giant copper-clawed owls or giant worms—easily provoked by human hubris. They can be rendered harmless, but this is more likely to be accomplished by quick-wittedness than by brute strength, as conveyed in the story of a grandmother and her young grandson who managed to destroy an owl inhabiting a glacier near Noogaayik (Smith, in Cruikshank et al., 1990:258–262). Similar narratives surround surges of the Donjek Glacier (Dadzik) and the Steele Glacier (named Gu cho ‘giant worm’), and scientists confirm the alarming noises emitted by surging glaciers.

Human populations along the Alsek and Tatshenshini were undoubtedly once substantial. Sockeye salmon ascending the relatively short distance from the coast made this river system a magnet for subsistence and trade, drawing people from Aishihik and Hutshi, as well as from Dry Bay and Lynn Canal (de Laguna, 1972:90). People who spoke with anthropologist Catharine McClellan in the late 1940s remembered Neskataheen as a “big city...thousands of years old” (McClellan, 1975:26). Yet the first visitor to leave a written account of his journey down the Tatshenshini, E.J. Glave, estimated in 1890 that despite evidence of former occupancy by “great numbers of people” who had “felled whole forests,” only 100 people of Southern Tutchone and Tlingit ancestry remained at Neskataheen. The older settlement of Noogaayik had already been abandoned (Glave, Nov. 22, 1890:286). By the 1950s, McClellan (1975: 24) found it difficult to determine what proportion of the 19th century population along the Alsek may have been Athapaskan, what proportion Tlingit, and to what extent the populations had merged. She points to the mid-19th century smallpox epidemic as responsible for breaks in memory, as well as devastating loss of life. Survivors on the Alsek moved downriver to Guseix at the mouth of this river, or upriver to Neskataheen on the Tatshenshini. A subsequent attack by Tanana from the northwest, reported by Glave in 1890 and remembered in the 1950s as “the war between Alaska and Canada,” further reduced the number of people living between Kluane Lake and Dezadeash Lake (McClellan, 1975:20, 26). As on the coast, impacts of disease and conflict may have been more devastating because they coincided with late stages of the Little Ice Age.

Athapaskans adopted coastal Tlingit clan names during the 19th century but eventually incorporated the clans into their moiety system rather than maintaining clan distinctions. By mid-20th century, they expressed only “half-hearted interest” in questions McClellan asked about Tlingit clans (McClellan, 1975:330–342). As on the coast, people still vividly recalled stories about how *Kaakiex’wtí* taught their ancestors to make fish traps (McClellan, 1975:27). But in narratives McClellan heard from Southern Tutchone in the 1950s, the point of view was inverted. Inland people were the ones who prospered after they acquired the services of *Kaakiex’wtí* and “put him to work” by arranging his marriage to an interior woman (Swanton, 1909:154–

169; 326–346; McClellan, 1975:27). Depictions Swanton heard of the Athapaskans that *Kaakiex’wtí* met as “wild” and needing instruction contrast sharply with those presented by Mrs. Annie Ned, a Southern Tutchone elder who was well into her nineties when we recorded her life story together during the 1980s. According to Mrs. Ned, when Tlingit traders first came inland, attracted by the wood chips they observed floating down the Alsek River, Athapaskans had both rich resources and ingenious technology. By contrast, Tlingit were relatively impoverished “poor cousins,” and she suggests that Athapaskans taught them all the skills they needed to survive. “They’ve got *nothing*, those Tlingit people, just cloth clothes, groundhog clothes. Nothing! Goat and groundhog, that’s all. But people here had lots of fur and they used it in everything themselves—ready-made moccasins, buckskin parky, silver fox, red fox, caribou-skin parky sewed up with porcupine quills...So that’s how they got it! Coast Indians got snowshoes and moose-skin clothes—all warm—parky, caribou parky, caribou blanket, caribou mattress. Anything like that they wanted to use. Those people wanted clothes from here in the Yukon...so they traded. They did it for a purpose!” (Ned, in Cruikshank et al., 1990:280). In the end, she says, Tlingit came to dominate trade with interior peoples only because of their greater access to consumer goods on the coast—sugar, tea, and tobacco—and the growing desire of inland people to acquire those goods. By 1950, the elders with whom McClellan (1975:24) spoke made a clear distinction between themselves and the “saltwater people” at Yakutat and Dry Bay.

Surging glaciers present some navigational, spiritual, and intellectual challenges of a sentient “land that listens.” Glacier stories may persist with such range and variety because of the ongoing risks they posed to everyday life well into the 20th century. There are serious prohibitions, both on the coast and in the interior, about making noise around glaciers. Yukon elders’ concerns about “cooking with grease” and their dismay at the notion of backcountry hikers’ frying bacon in Kluane National Park have already been noted. Annie Ned (b. 1890s) told about the near-surge of a glacier at the head of Kusawa Lake that occurred when a careless Southern Tutchone hunter used goat grease for cooking. Catastrophe was averted only by the quick thinking of another man, who had the good sense to tear up an old blanket and throw it into the fire. She maintains that if glaciers are attracted by cooking smells, they are equally repelled by the smell of old clothes or old blankets (Ned, in Cruikshank et al., 1990:332–336; de Laguna, 1972:818). Glacier stories in the Yukon range from eyewitness accounts such as Mrs. Ned’s to those that invoke characters from myth time. One lengthy story about Woodpecker and Wolf, for instance, centers on successive hunting episodes at a glacier den, where fat incautiously left at the hunting site overnight swells into a glacier. In that story, the ambiguity of the inhabitant shifts from Owl to Moose, possibly because they have the same Tlingit name, which McClellan (1975:108, 170) transcribed phonetically as

*ts'isk'w*. Glaciers are also reminiscent of the transitional “other side” of the world where many older stories are set, a winter world where everything, including humans and animals, remains white.

These concepts, of course, differ markedly from those of late 19th century Euro-American visitors to this region, and their collisions also tell a story. The strangeness of such “beliefs” was reported in an account by flamboyant Arctic traveler Frederick Schwatka, who visited in summer 1891. He was accompanied by the young geologist Willard Hayes, later Chief Geologist with the U.S. Geological Survey from 1905 to 1911 (Harris, 1996:24). They made an exploratory journey from Juneau, Alaska inland to the Yukon River, and then traveled overland from Fort Selkirk to the Copper River, passing near the area where Kitty Smith had recently been born. They hired local guides through glacier country only with great difficulty. As they prepared to cross the Klutlan Glacier, Schwatka dismissively noted in his journal his guides’ insistence that “we must not fry grease in our pans...or the ice of the glaciers will tumble in as we cross and kill us all.” With Anglo-Victorian humour, he commented: “We easily catered to this and told them we would forbear oleaginous condiments rather than have a ton of ice tumble on us.” He describes their route as “simply frightful,” noting that the guides “besought us to make no noise while on the ice or the crevasses would open wider and swallow us up...They firmly resented even our whispering, so fearful were they of its consequences.” His conclusion says much about competing knowledge systems that were already being differentiated hierarchically: “Before crossing, they all ‘made medicine’ and no doubt it saved many valuable lives. Their fear of glacial ice is too pronounced and manifest to be based on any general physical reasons, and must be accounted for wholly by superstition” (Harris, 1996:168–169). This 1891 manuscript was first published in 1996. The editor’s footnote at this point indicates that Schwatka’s comments should be taken as straightforward common sense. “The origin of the Pelly River Natives’ unreasonable or superstitious fear of glacier ice and the connection with frying with grease is not known...” (Harris, 1996:169, note 62). And presumably, from this perspective, it is of little significance a century later.

#### DISCUSSION: INTERSECTING NARRATIVES?

On the surface, narratives that geophysical scientists and Athapaskan/Tlingit elders tell about glaciers seem largely incompatible. Glaciers that are equipped with senses of smell and hearing, alert to the behavior of humans and quick to respond to human indiscretion, sound wholly unlike glacier field sites where scientists can “sieve” for reductive moments that allow measurement of variables involved in climate change. Environmental earth scientists—geophysicists, physical geographers, geologists—study processes that are thousands or even millions of

years old, and this seems further to confound issues of commensurability. So are there ways of speaking about global issues such as climate change that accord weight to culturally specific understandings as well as to the universalistic frameworks of science?

Internationally, there has been an explosion of interest in indigenous knowledge or “traditional ecological knowledge” during the 1990s. At the end of the 20th century, “TEK” is a term ubiquitous in resource management plans concerning caribou, fisheries, and forestry management (the management having primarily to do with regulating human *use* of ungulates, fish, and forests). A growing critique of the uses and abuses of traditional knowledge identifies an underlying, problematic premise of TEK studies: that they treat deeply different cultural perspectives as bridgeable by concepts such as “biodiversity,” “sustainable development” or “co-management” framed within scientific discourse (Morrow and Hensel, 1992; Fairhead and Leach, 1996). Anthropologists have questioned both the validity of subsuming varieties of indigenous knowledge within theoretical frameworks that rely on North Atlantic notions of intentionality and subjectivity (Bruun and Kalland, 1995; Scott, 1996) and the consequences of appropriating locally generated knowledge as a flag of convenience for bureaucratic management strategies (Nadasdy, 1999). Oral traditions from northwestern North America consistently demonstrate the social nature of all relations between humans and nonhumans (animals, plants, and landscape features, such as glaciers), a concept that fits awkwardly with Western science. Codified in government reports, information formulated as TEK tends to reify and reinforce a Western dualism—prying nature from culture—that local narratives challenge in the first place. Sentient landscapes shift their shape once they are engulfed by these frameworks and transformed into “land and resources.”

Bruno Latour (1998), who bridges with apparent effortlessness this historically constructed Great Divide between Nature and Culture, formulates the issues succinctly. The definition of society so critical to our understanding of social worlds, he suggests, was ill conceived from the outset because it emerged as a foil for science. The rise of professional science made possible by this definition was characterized by certainty and by the capability of resolving both disputes and society’s ills, and it was founded on a paternal detachment from ideology, passion, or emotion. Latour poses a metaphor: society was seen as the flesh of a peach, with science as its hard pit, the site where reality could be defined, where facts could be systematically sorted from values, and objectivity pried from subjectivity. Such distinctions now seem ludicrous in a world of mad cows, ozone holes, zygotes, and climate change, and Latour describes the growing shift in contemporary public expectations about science. Science, he says, must redefine itself as research committed to understanding uncertainty and risk, prepared to contribute to controversies rather than end them, and expected to add to complexity rather than to create social order.

Social sciences can contribute to such research strategies by shifting the axis from modernist *distinctions* between “natural” and “social” knowledge to emerging *intersections* between global and local knowledge, a framework especially apt in the Gulf of Alaska, where both European and indigenous forms of internationalism flourished two centuries ago. Historical approaches are well suited to documenting the long-term consequences of subordinating local values. Comparative approaches can examine how local values contribute perspectives essential for the broader understandings now required to address global environmental issues. Both historical and comparative approaches take account of the power dynamics underlying any production of knowledge. At the same time, they insist that local knowledge be taken seriously and given opportunities to interrogate scientific perspectives, a process already occurring in a variety of settings (Cronon, 1992; Kearney, 1994; Agrawal, 1995; Watson-Verran and Turnbull, 1995; Wynne, 1996; Sillitoe, 1998; Usher, 2000).

A historical approach to glacier knowledge reveals how quickly specialized knowledge can replace prior organizing principles. Indigenous oral traditions in northwestern North America frame glaciers as *social* spaces where humans must be attentive to subtlety, an idea that Schwatka already found amusing by 1891. During the intervening century, scientific discourse has gained authority, and many scientists, parks managers, ecotourists, and the general public have adopted conceptions of glaciers as places of *raw nature*. Regional political and economic practices involved in setting aside protected areas such as national parks and World Heritage Sites intersect with global practices that first displace people from their traditional lands and then make claims *from* those sites. Ironically, these claims sometimes include asking former residents to document their “traditional knowledge” of those alienated lands. If local knowledge is to play any role in policy decisions, it cannot be treated as ahistorical, timeless, abstract data. All forms of local knowledge have histories and are transmitted within specific political and historical circumstances. In the spaces now designated as national parks, science and oral history are both kinds of “local knowledge” sharing a common history that includes both unequal access to cultural and material resources and growth of one kind of knowledge at the expense of another.

Ideas about sentient landscapes are not so distant in western European history, where their suppression can also be documented. Using sources from medieval archives, Emanuel Ladurie (1971) documented the expansion of the Little Ice Age in medieval Europe during the late Middle Ages. He cites evidence of tithes unpaid and lawsuits launched as advancing glaciers from Chamonix crushed and buried hamlets, farms, and even medieval gold mines. He describes the desperate citizens, who drew swords as they confronted glacial caves and put crosses at the edges of advancing moraines in an attempt to arrest the onslaught of ice. These responses evoke the same sense of guarded interaction that we hear in Southern Tutchone

narratives that characterize glaciers as sentient, as well as in Percy Shelley’s poem written from Mont Blanc in 1816.

Povinelli traces the suppression of similar ideas emerging from Medieval Europe: as concerns about manufacturing and imperialism advanced during the 18th and 19th centuries, “a country that listens” (1993:6) had to be rejected. Industrialists were not about to stand for objects that acted willfully, for how could manufacturing proceed in these circumstances? The New Science, she points out, came to see alchemy as too animistic and willful objects as too troublesome and elected mechanical models instead (see also Shapin and Schaffer, 1985). Such models were ultimately transposed to social sciences, which posited a “natural” social order, liable to human manipulation. Inevitably, categories of humans deemed merely to respond (archetypal constructions of “natural” hunters and gatherers) emerged. The knowledge held by these peoples was reformulated as superstition, a process illustrated by Schwatka’s journal notes. The recent resurrection of knowledge once marginalized and now reframed as indigenous science (but still narrowly interpreted as data) does not resolve this issue. As Povinelli demonstrates, when we don’t take counter-discourses seriously, “we contribute to the state’s domination, delegitimization, or worse, contextualization of indigenous knowledges as primitive (or irrelevantly subaltern) in one way or another” (Povinelli, 1993:12; see also Povinelli, 1995).

A comparative approach has different advantages. The balance of evidence suggests that our human ability to come to terms with global environmental problems will depend as much on human values as on scientific expertise, especially in an increasingly alienating and uncertain world. Science and local knowledge have come to be seen as polar opposites, yet mutual stereotypes share similarities. From a scientific perspective, local knowledge may appear as “myth” (vague, subjective, context-dependent, and open to multiple interpretations) and as embedded in social institutions (such as kinship) and may come to be regarded, in Brian Wynne’s phrase, as “epistemically vacuous.” But local people are quite likely to characterize science in similar terms: as illusory, vague, subjective, context-dependent, and open to multiple interpretations, and as embedded in social institutions (such as distant universities)—in other words, as socially valueless (Wynne, 1996; see also Watson-Verran and Turnbull, 1994).

Here, too, glaciers provide rich ways to think about these issues. A dominant theme in Subarctic oral traditions from the Little Ice Age concerns living with unprecedented risks associated with rapid climate change, and specifically with the behavior of glaciers—unexpected advances, violent surges, catastrophic floods, and accompanying weather variations. Athapaskan and Tlingit travelers clearly accumulated enormous knowledge about glacier travel, the kind acquired only by long experience of living on the land rather than observing from a distance. Topham (1889:432), for instance, expressed surprise that his Yakutat guide casually described a three-day hunting trip he had recently made

over glaciers to the north peak of Mount Saint Elias only *after* he returned Topham safely from the same expedition. Overlapping with accounts from passing historical observers and contemporary field scientists, Tlingit and Athapaskan observations about the behavior of glaciers attest to the porosity of approaches to knowledge. Like science, these oral traditions are grounded in a material world: subsistence patterns and trade arrangements that were changing rapidly during the 18th and early 19th centuries. Residents had to be observant and attentive to unexpected changes and prepared to make innovative and flexible responses. In other words, local knowledge of the world now deemed “natural” has more similarities with contemporary science than differences from it (Kuzyk et al., 1999).

Oral traditions do differ from science, however, in the cultural models they embody. Oral traditions are more transparently reflexive than science, which often seems more likely to bury its assumptions and be less self-consciously aware of the institutional history of its practices. Science achieves its greatest triumphs when it can isolate experimental moments that illuminate causes, consequences, and intersections of variables. The scientist is conceptualized as remaining at a distance from the experiment, and replicability is ensured by submitting to standard practices. In science, attempts to achieve reductive moments, decontextualized knowledge, and absence of actor interference are critical—epitomized in Donna Haraway’s phrase the “god-trick” and Steven Shapin’s (1998) critique of the positionless “view from Nowhere.”

Local knowledge embedded in oral tradition remains committed to controlling outcomes (though less interested in predicting them), more like experiential than experimental science. The key distinction is commitment to an active, thoroughly positioned human subject whose behavior is understood to have consequences (such as causing glacial surges). In oral narratives from this region, we hear stories about the importance of human agency, human choice, human responsibility, and the consequences of human behavior, and it is here that one of their contributions to climate change research may lie. Narratives underscore the social content of the world and the importance of taking personal and collective responsibility for changes in that world. The performative “working” capacity of oral tradition is crucial here. Stories about glaciers have two important attributes. On the one hand, they are *referential*. Like science, they do indeed refer to an external reality that may encompass historical events such as glacial surges. On the other hand, narratives centering on glaciers are also *constitutive*. Glacier narratives have the power to create or to establish what they signify—in this case, a land that responds to humans in a reciprocal rather than a hostile manner. This constitutive part asserts the ongoing importance of human agency and human responsibility, a perspective that is frequently missing from detached scientific expertise.

In the past, then, things and people were always entangled. In the future, they will be more entangled than ever

before. Local knowledge in northern narratives is *about* unique entanglements of the physical and the social, and increasingly we see this view in science as well as in northern oral traditions. Ultimately, we need knowledge bridges that work from local concepts as well as from science if we are to bring broadly based human values to bear on problems such as climate change. Following Latour’s advice about the need for sciences to address uncertainty, we would do well to take Broecker’s bridging metaphor that opened this essay as seriously as we take his science: “The climate system is an angry beast and we are poking at it with sticks!”

#### ACKNOWLEDGEMENTS

The research on which this paper is based was funded by the Social Sciences and Humanities Research Council of Canada Grant #410-99-0027. I particularly thank Mrs. Annie Ned, Mrs. Angela Sidney, and Mrs. Kitty Smith, who discussed these issues with me over many years. I also thank the Champagne-Aishihik First Nation for including me in a visit that members made to Yakutat, Alaska, in June 1999, and especially Diane Strand, Sarah Gaunt, John Fingland, and Steven Reid, who continue to help me understand the local complexities of these issues. The facilities provided by the Arctic Institute’s Kluane Research Station and conversations there with David Hik, Peter Johnson, and Andy Williams helped push my questions along. Nora and Richard Dauenhauer, Catharine McClellan, and Frederica de Laguna have all provided invaluable suggestions. I especially thank Garry Clarke, Karen McCullough, Thomas Thornton, and three anonymous reviewers for helpful comments on earlier drafts of this manuscript.

#### REFERENCES

- AGRAWAL, A. 1995. Dismantling the divide between indigenous and scientific knowledge. *Development and Change* 26: 413–449.
- AMES, K.M. 1994. The Northwest Coast: Complex hunter-gatherers, ecology, and social complexity. *Annual Review of Anthropology* 23:209–229.
- BEATTIE, O., APLAND, B., BLAKE, E.W., COSGROVE, J.A., GAUNT, S., GREER, S., MACKIE, P., MACKIE, K.E., STRAATHOF, D., THORP, V., and TROFFE, P.M. 2000. The Kwäday Dän Ts’ínchj discovery from a glacier in British Columbia. *Canadian Journal of Archaeology* 24:129–147.
- BELCHER, CAPT. E. 1843. Narrative of a voyage round the world performed in her Majesty’s ship *Sulphur* during the years 1836–1842. London: Henry Colburn.
- BOYD, R. 1999. The coming of pestilence: Introduced infectious diseases and population decline among Northwest Coast Indians, 1774–1874. Vancouver: UBC Press and Washington: University of Washington Press.



- BRUUN, O., and KALLAND, A. 1995. Asian perceptions of nature: A critical approach. Richmond, England: Curzon.
- BUSHNELL, V.C., and RAGLE, R.H. 1969, 1970, 1972. Icefield Ranges Research Project: Scientific results. New York and Montreal: American Geophysical Society and Arctic Institute of North America. Vols. 1–3.
- BUSHNELL, V.C., and MARCUS, M.G. 1974. Icefield Ranges Research Project: Scientific results. New York and Montreal: American Geophysical Society and Arctic Institute of North America. Vol. 4.
- CLAGUE, J. 1979. An assessment of some possible flood hazards in Shakwak valley, Yukon Territory. In: Canada, Geological Survey Paper 79-1B, Current Research, Part B. 63–70.
- COHEN, S.J., ed. 1997. Mackenzie Basin Impact Study: Final report. Environment Canada and the University of British Columbia. Ottawa: Minister of Supply and Services.
- CRONON, W. 1992. A place for stories: Nature, history and narrative. *The Journal of American History* 78(4):1347–1376.
- CRUIKSHANK, J. 1979. Athapaskan women: Lives and legends. Canadian Ethnology Service, Paper No. 57. Ottawa: National Museums of Canada
- . 1985. The gravel magnet: Some social impacts of the Alaska highway on Yukon Indians. In: Coates, K., ed. *The Alaska highway: Papers of the 40th Anniversary Symposium*. Vancouver: UBC Press. 172–187.
- . 1998. Yukon Arcadia: Oral tradition, indigenous knowledge and the fragmentation of meaning. In: Cruikshank, J. ed. *The social life of stories: Narrative and knowledge in the Yukon Territory*. Lincoln: University of Nebraska Press and Vancouver: UBC Press. 45–70.
- CRUIKSHANK, J., in collaboration with SIDNEY, A., SMITH, K. and NED, A. 1990. Life lived like a story: Life stories of three Yukon elders. Lincoln: University of Nebraska Press and Vancouver: UBC Press.
- DAUENHAUER, N.M., and DAUENHAUER, R. 1987. Haa shuká, our ancestors: Tlingit oral narratives. Seattle: University of Washington Press and Juneau: Sealaska Heritage Foundation.
- DAVIS, S.D. 1990. Prehistory of southeastern Alaska. In: Suttles, W., ed. *Handbook of North American Indians*, Vol. 7, Northwest Coast. Washington, D.C.: Smithsonian Institution. 197–202.
- DE LAGUNA, F. 1972. Under Mount Saint Elias: The history and culture of the Yakutat Tlingit. 3 Vols. Washington, D.C.: Smithsonian Contributions to Anthropology 7.
- . 1990. Tlingit. In: Suttles, W., ed. *Handbook of North American Indians*, Vol. 7, Northwest Coast. Washington, D.C.: Smithsonian Institution. 203–228.
- DE LAGUNA, F., and McCLELLAN, C. 1981. Ahtna. In: Helm, J. ed. *Handbook of North American Indians*, Vol. 6, Subarctic. Washington, D.C.: Smithsonian Institution. 641–663.
- DE LAGUNA, F., RIDDELL, F.A., MCGEEIN, D.F., LANE, K.S., and FREED, J.A. 1964. Archaeology of the Yakutat Bay area, Alaska. Smithsonian Institution Bureau of American Ethnology, Bulletin 192. Washington: U.S. Government Printing Office.
- DUNMORE, J., and DE BROSSARD, M. 1985. *Le Voyage de Lapérouse, 1785–1788*. 2 Vols. Paris: Imprimerie Nationale.
- FAIRHEAD, J., and LEACH, M. 1996. *Misreading the African landscape: Society and ecology in a forest-savanna mosaic*. Cambridge: Cambridge University Press.
- FIENUP-RIORDAN, A. 1999. *Yaqulget qaillun pilartat* (what the birds do): Yup'ik Eskimo understanding of geese and those who study them. *Arctic* 52(1):1–22.
- GLAVE, E.J. 1890. Our Alaska expedition. *Frank Leslie's Illustrated Newspaper* 70: Nov. 22.
- GOLDSCHMIDT, W.R., and HAAS, T.H. 1998. Haa aaní: Our land. In: Thornton, T.F., ed. *Tlingit and Haida land rights and use*. Seattle: University of Washington Press and Juneau: Sealaska Heritage Foundation.
- GROVE, J. 1988. *The Little Ice Age*. London: Methuen.
- HARINGTON, C.R. 1992. The year without a summer? World climate in 1816. Ottawa: Canadian Museum of Nature.
- HARRIS, A.S., ed. 1996. *Schwatka's last search: The New York Ledger Expedition through unknown Alaska and British America: Including the journal of Charles Willard Hayes, 1981*. Fairbanks: University of Alaska Press.
- HOLDSWORTH, G. 1999. Mount Logan on CD-ROM. Vol. 1. Calgary: The Arctic Institute of North America.
- IPCC (INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE). 1996. *Climate change 1995: Economic and social dimensions of climate change*. Edited by Bruce, J.P., Lee, H., and Haites, E.F. Cambridge: Cambridge University Press.
- KAN, S. 1999. *Memory eternal: Tlingit culture and Russian Orthodox Christianity through two centuries*. Seattle: University of Washington Press.
- KEARNEY, A.R. 1994. Understanding global change: A cognitive perspective on communicating through stories. *Climate Change* 27:419–441.
- KLOTZ, O. 1899. Notes on glaciers of southeastern Alaska and adjoining territory. *Geographical Journal* 14:523–534.
- KRAUSS, M.E., ed. 1982. In honour of Eyak: The art of Anna Nelson Harry. Fairbanks: Alaska Native Language Center.
- KUKLICK, H., and KOHLER, R.E. 1996. Introduction. In: Kuklick, H., and Kohler, R.E., eds. *Science in the field*. *Osiris* 11:1–14.
- KUZYK, G., RUSSELL, D.E., FARNELL, R.S., GOTTHARDT, R.M., HARE, P.G., and BLAKE, E. 1999. In pursuit of prehistoric caribou on Thandlát, southern Yukon. *Arctic* 52(2):214–219.
- LADURIE, E.L. 1971. *Times of feast, times of famine: A history of climate since the year 1000*. New York: Doubleday.
- LATOURE, B. 1998. From the world of science to the world of research. *Science* 280, April 10:206–209.
- MATSON, R.G., and COUPLAND, G. 1995. *The prehistory of the Northwest Coast*. New York: Academic Press.
- McCLELLAN, C. 1975. *My old people say: An ethnographic survey of southern Yukon Territory*. 2 Vols. Publications in Ethnology 6 (1 & 2). Ottawa: National Museums of Canada.
- . 1981. Intercultural relations and cultural change in the cordillera. In: Helm, J., ed. *Handbook of North American Indians*, Vol. 6, Subarctic. Washington, D.C.: Smithsonian Institution. 387–401.
- MILET-MUREAU, L.A., ed. 1799. *A voyage round the world, performed in the years 1785, 1786, 1787 and 1788 by the Boussole and Astrolabe under the command of J.F.G. de La Pérouse*. London: G.G. and J. Robinson.

- MILLER, D.J. 1960. Giant waves in Lituya Bay, Alaska. U.S. Geological Survey Professional Paper 354-C. Washington, D.C. 51–86.
- MOORE, P. 1999. Dene gudeji: Kaska narratives. Whitehorse, Yukon: Kaska Tribal Council.
- MORROW, P., and HENSEL, C. 1992. Hidden dissension: Minority-majority relationships and the uses of contested terminology. *Arctic Anthropology* 29(1):38–53.
- MURRAY, A.H. 1910. *Journal of the Yukon, 1847–48*. Ottawa: Government Printing Bureau. 125 p.
- NADASDY, P. 1999. The politics of TEK: Power and the 'integration' of knowledge. *Arctic Anthropology* 36(1-2): 1–18.
- NYMAN, E., and LEER, J. 1993. 'Gágiwdil.àt': brought forth to reconfirm: The legacy of a Taku River Tlingit clan. Whitehorse: Yukon Native Language Center; Fairbanks: Alaska Native Language Center.
- OLSON, W.M., ed. 1993. *The travel journal of Archibald Menzies, 1793-1794*. Fairbanks: University of Alaska Press.
- OVERPECK, J., HUGHEN, D., HARDEY, D., BRADLEY, R., CASE, R., DOUGLAS, M., FINNEY, B., GAJEWSKI, C., JACOBY, G., JENNINGS, A., LAMOUREAUX, S., LASCA, A., MACDONALD, G., MOORE, J., RETEILE, M., SMITH, S., WOLFE, A., and ZIELINSKI, G. 1997. Arctic environmental change of the last four centuries. *Science* 278, November, 14:1251–1256.
- PETERSON, D.L., and JOHNSON, D. 1995. Human ecology and climate change at northern latitudes. In: Peterson, D.L., and Johnson, D.R. eds. *Human ecology and climate change: People and resources of the far North*. Washington: Taylor and Francis. 3–13.
- POVINELLI, E. 1993. *Labor's lot: The power, history and culture of Aboriginal action*. Chicago: University of Chicago Press.
- . 1995. Do rocks listen? The cultural politics of apprehending Australian Aboriginal law. *American Anthropologist* 97(3): 505–518.
- POWELL, R.D. 1995. Role of physical sciences in global change research at Glacier Bay National Park and Preserve. In: Engstrom, D.R., ed. *Proceedings of the Third Glacier Bay Science Symposium, 1993*. Anchorage: National Park Service. 1–4.
- ROOTS, F. 1993. Environmental responses of high-latitude mountainous areas to global change, and likely socio-economic consequences. Abstract, EuroMAB IV, Zakopane, Poland, 6–11 September 1993.
- RUSSELL, I.C. 1892. Mount Saint Elias and its glaciers. *American Journal of Science*. 3rd series 43:169–82.
- SCHROEDER, R.F. 1995. Historic and contemporary Tlingit use of Glacier Bay. In: Engstrom, D.R., ed. *Proceedings of the Third Glacier Bay Science Symposium, 1993*. Anchorage: National Park Service. 278–293.
- SCOTT, C. 1996. Science for the West, myth for the rest? The case of James Bay Cree knowledge construction. In: Laura Nader, ed. *Naked science: Anthropological inquiry into boundaries, power, and knowledge*. London: Routledge.
- SHAPIN, S. 1996. *The scientific revolution*. Chicago and London: University of Chicago Press.
- . 1998. Placing the view from nowhere: Historical and sociological problems in the location of science. *Transactions of the British Geographers NS* 23:5–12.
- SHAPIN, S., and SCHAFFER, S. 1985. *Leviathan and the air pump: Hobbes, Boyle and the experimental life*. Princeton: Princeton University Press.
- SHELLEY, P. 1994. *The complete poems of Percy Shelley, with notes by Mary Shelley*. New York: The Modern Library.
- SIDNEY, A. 1982. *Tagish tlaagú: Tagish stories*. Recorded by J. Cruikshank. Whitehorse: Council for Yukon Indians and Government of Yukon.
- SILLITOE, P. 1998. The development of indigenous knowledge: A new applied anthropology. *Current Anthropology* 39(2): 223–252.
- SMITH, K. 1982. *Nindal kwädindür: I'm going to tell you a story*. Recorded by J. Cruikshank. Whitehorse: Council for Yukon Indians and Government of Yukon.
- STEVENS, W.K. 1998. Scientists at work, Wallace Broecker: Iconoclastic guru of the climate debate. *New York Times*, March 17.
- SWANTON, J.R. 1908. The social conditions, beliefs and linguistic relationships of the Tlingit Indians. Bureau of American Ethnology, Annual report 1904–05. 391–485.
- . 1909. Tlingit myths and texts. Washington, D.C.: Bureau of American Ethnology Bulletin 39.
- TARR, R., and BUTLER, B.S. 1909. *The Yakutat Bay Region, Alaska*. Washington, D.C.: Government Printing Office.
- TARR, R., and MARTIN, L. 1914. *Alaska glacier studies*. Washington, D.C.: National Geographical Society.
- THORNTON, T. 1995. Tlingit and Euro-American toponymies in Glacier Bay. In: Engstrom, D., ed. *Proceedings of the Third Glacier Bay Science Symposium, 1993*. Anchorage: National Park Service. 294–301.
- . 1997. Know your place: The organization of Tlingit geographic knowledge. *Ethnology* 36(4):295–307.
- TOM, G. 1987. *Èkeyi: Gyò cho chú. My country: Big Salmon River*. Whitehorse: Yukon Native Language Centre.
- TOPHAM, H.W. 1889. A visit to the glaciers of Alaska and Mount Saint Elias. *Proceedings of the Royal Geographical Society* 11:424–433.
- USHER, P. 2000. Traditional ecological knowledge in environmental assessment and management. *Arctic* 53(2):183–193.
- WATSON-VERRAN, H., and TURNBULL, D. 1994. Science and other indigenous knowledge systems. In: Jasanoff, S., Markle, G., Peterson, J., and Pinch, T., eds. *Handbook of science and technology studies*. Thousand Oaks, California: Sage. 115–139.
- WYNNE, B. 1996. May the sheep safely graze? A reflexive view of the expert-lay knowledge divide. In: Lash, S., Szerszynski, B., and Wynne, B. eds. *Risk, environment and modernity*. London: Sage. 44–83.